# Relevant Researches on Tolerance of Ambiguity

Chen Liu
Shandong Normal University, China

*Abstract*—**Stemming from the study on Intolerance of Ambiguity in psychological field, the study towards Tolerance of Ambiguity (TOA) has become a topic which more and more researchers take interest in. Great efforts have been made on the theoretical and practical development of this research focus from both the psychological field and the second / foreign language acquisition field. As the theoretical framework has been constructed so as to explore the connotation of TOA, a lot of empirical researches have been made either to find out the appropriate measurement instrument or to detect the correlation between TOA and other variables in both psychological and linguistic area. A thorough review of relevant researches about TOA will help us to be aware of the current tendencies as well as the potentials for further study in the future.**

*Index Terms*—**tolerance of ambiguity (TOA), second / foreign language learning, measurement of TOA**

## I. INTRODUCTION

Studies towards Tolerance of Ambiguity (TOA) stemmed from the study on Intolerance of Ambiguity in psychological field. Ever since McDougall (1926) made one of the earliest attempts to relate personality traits to an ambiguity variable, a good number of researchers have contributed a lot on both theoretical and practical development of this focus not only in psychological field but also in second / foreign language acquisition field. At the same time when great efforts from great amounts of researchers have been made to construct the theoretical framework about tolerance of ambiguity by exploring its definition, efforts have never been stopped towards designing an appropriate instrument with great validity and reliability to measure tolerance of ambiguity by researchers from the very pioneer stage initiating this research focus up till now, as the scales "may reinforce and illuminate their parent theories", by firstly showing "evidence of containing the elements defined by their theories" and secondly showing "the expected relationships with the correlates adduced from the theory" (Kirton, 1981, p. 413).

## II. MEASUREMENT OF TOLERANCE OF AMBIGUITY

The earliest attempt towards such kind of paper-and-pencil measurement of tolerance of ambiguity construction is Walk's "intolerance of ambiguity" Scale made by Richard D. Walk in 1950s. This unpublished instrument, in which 8 items are designed with the possible answer from "strongly agree" to "strongly disagree", was frequently used by the early psychologists or psychoanalysts as a reliable measurement towards intolerance of ambiguity. However, even the author of this scale advised that the reliability of the instrument was unknown and that the scale was not successful as a measure when related to perceptual stimulus. Later, through personal communication with the author and further statistical study, Ehrlich (1965) concluded that "Walk's A Scale is not homogeneous and cannot, therefore, be legitimately viewed as a pure measure of the postulated attribute" (Ehrlich, 1965, p. 593). Martin & Westie (1959) and Child (1965) also tried to develop such tests, only to end up with the lack of internal consistency.

On the more positive side, the Budner (1962) Scale of Tolerance-Intolerance of Ambiguity has shown fairly good internal consistency and is therefore used as instrument more often. Budner's scale, including 16 items with half positive and half negative statement, is a 7-point Likert scale ranging from 1-7 (strong disagreement to strong agreement) for positively worded items and the reverse for negative items. The possible scores for the scale extend from 1-16 for strong disagreement to 96-112 for strong agreement, with varying ranges between. Based on this scoring system, the higher the score obtained, the more intolerant the person is. Items are designed to tap at least one postulated indicator of perceived threat, namely, phenomenological submission or denial and operative submission or denial and to refer to three types of ambiguous situations: novelty, complexity and insolubility. Reliabilities (alpha coefficients) reported for 13 of his 17 samples ranged from .39 to .62, with a mean of approximately .49.

Rydell & Rosen's (1966) tolerance of ambiguity scale is another measurement construct, which is commonly used. This scale consists of 16 true-false items that assess tolerance of ambiguity with a split-half reliability of .86 and retest reliability of .63. Later, MacDonald (1970) modified Rydell & Rosen's instrument by adding four additional items: two from the California Personality Inventory and two from Barron's conformity scale to increase the reliability. Accordingly, MacDonald developed the AT-20 scale with the high construct validity and internal consistency. Through MacDonald's practical research, the AT-20 "shows promise of being a useful instrument for the measurement and further investigation of ambiguity tolerance" (MacDonald, 1970, p. 797).

Budner's 16-item scale and Rydell & Rosen and MacDonald's AT-20 scale was later analyzed by Kirton (1981), together with their correlations with Rokeach's D Scale for dogmatism, Gough's sub-scale from the CPI for inflexibility and Wilson & Patterson's Conservatism Scale for conservatism. On the basis of detailed research, Kirton developed a

shortened scale from Budner and Rydell & Rosen and MacDonald's scales, with 7 items left from Budner's 16-item scale and 11 items left from Rydell & Rosen and MacDonald's AT-20 scale. The shortened scale with these surviving intolerance of ambiguity items was proved to be with improved psychometric characteristics, better internal reliabilities and more consistent relationship with other tests, to achieve a final purpose of refining theoretical definition supported by data.

Another widely used scale was designed by Norton (1975). Norton's Measurement of Ambiguity Tolerance(MAT-50) is a 7-point scale containing 61 items that correspond to eight different categories: philosophy, interpersonal communication, public image, anything that is job-related, problem solving, social, habit, and art forms. Each item reflects a potentially ambiguous situation and incorporates some function of tolerance (7 items) or intolerance(54 items) of this situation. The possible scores for the scale extend from 1-61 for very strong disagreement to 367-427 for very strong agreement, with varying ranges in between. The higher score indicates higher ambiguity intolerance. After the validity studies from three aspects of content validity, criteria-related validity and construct validity, the scale is proved to have an internal reliability of .88 and high test-retest reliability of .86 when compared with other scales.

Then, Nutt (1988) modified Budner's version and made Nutt's scale of tolerance / intolerance ambiguity, which contains 15 questions about personal and work situations with ambiguity. The answer to each question is based on a scale from 1 to 7, with the total score of 15 as a perfectly tolerant person and 105 as a perfectly intolerant person. Nutt's study has the report of scores ranging from 20 to 80, with a mean of 45.

Another instrument reported use by researchers is Hartmann Boundary Questionnaire (HBQ) made by Hartmann (1991). But this scale, which contains twelve priori categories, is much more oriented to the concept of ego boundary.

McLain (1993) has developed the Multiple Stimulus Types Ambiguity Tolerance Scale (MSTAT-I) by updating the cognitive constructs of prior scales. This 22-item Likert response instrument addresses characteristics of ambiguous stimuli and reactions to perceived ambiguity. A .86 Alpha reliability and significant positive correlations with the Budner and MacDonald scales are presented in support of psychometric quality.

All of the above scales discussed bear great importance in the research work having been done, yet, none of those is specifically designed for the research in second or foreign language learning framework. In 1989, Ely designed a situation-specific tolerance of ambiguity scale in the research of extending second language learning approach to the consideration of tolerance of ambiguity. This Second Language Tolerance of Ambiguity Scale (SLTAS), which consists of 12 self-report items, presenting in a 6-point Likert scale, with possible responses of "strongly disagree", "moderately disagree", "slightly disagree", "slightly agree", "moderately agree", or "strongly agree", was developed for measuring individual differences in the specific environment faced by the second language learner. Various aspects of language learning and use, including pronunciation, speaking, listening, reading comprehension, lexical development, grammar learning and writing, are included in the scale. The possible scores for the scale extend from 1-12, for strong disagreement, to 61-72 for strong agreement, with varying ranges in between. The higher the score obtained, the more intolerant the person is. Since this scale has been proved to have a high internal consistency of .84 and is specially designed to measure the construct of tolerance of ambiguity in the specific context of second language learning, it has been frequently used by researchers in linguistic domain.

Chinese researcher Wen Qiufang (2003) also devoted to the instrument towards tolerance of ambiguity by developing a self-testing pencil-and-paper scale. On reference of Brown's *Breaking the Language Barriers* (1991), Wen designed an 8-item Likert scale in Chinese language, for the purpose of self-examining for English as foreign language learners in China. The higher the score obtained, the less tolerant the learner is. Yet, the validity and reliability of the scale is not elaborated and need further exploration.

One thing necessary to be noticed is that when using these various scales to conduct practical researches, several issues need to be taken into consideration. The first issue is the student level. Each item in the scale needs to be carefully examined to make sure that it is grammatically and lexically appropriate for the students' English level. Often it may be necessary to simplify or totally rewrite an item to make it comprehensible to a particular group of EFL students. Second, if we are using a scale designed for a specific situation, such as the tolerance of ambiguity scale by Ely, it is important to have the items really represent the types of language learning that the students are experiencing. Finally, if we have a group of students who all speak the same first language, we can use a translated form of an instrument-noting, though, an accurate and faithful translation is needed to be guaranteed through certain procedures carefully followed.

## III.   RELATED RESEARCHES TOWARDS TOLERANCE OF AMBIGUITY IN PSYCHOLOGICAL DOMAIN

Tolerance of ambiguity, as a key element in psychological field, ever since being proposed, numerous studies have been taken towards its relationship with various variables by either psychologists or psychoanalysts. Those which are most influential and worth of attention will be summarized here.

Tolerance of ambiguity in the psychological field is at the very beginning identified as a personality trait. Frenkel-Brunswik (1949) associated intolerance of ambiguity with authoritarianism, prejudice and mental rigidity and described it as characterized by resistance to reversal of apparent fluctuating stimuli, the early selection and maintenance of one solution in an ambiguous situation, disinclination to allow for good and bad traits in the same person, acceptance of attitudes representing a black-and-white view of life, seeking of certainty, rigid dichotomizing

into fixed categories, premature closure, and remaining closed to familiar characteristics of stimuli. According to Furnham (1995), O'Connor attempted a similar study by looking at the relationship between tolerance of ambiguity, ethnocentrism, and abstract reasoning in 1952. Results showed that tolerance of ambiguity and ethnocentrism are positively correlated and that tolerance of ambiguity and abstract reasoning are not related, apart from their common tendency to vary with ethnocentrism.

According to Malaska (1997), Ellsberg moved in a different direction with tolerance of ambiguity theory, relating it to rational decision-making and ambiguity aversion effects. Ellsberg suggested that conservative-minded individuals make decision by calculating the expected utility of the ambiguous prospects and the expected utility from the least favorable among all probable probabilities. If the individual is optimistic-minded, then decisions were made based on the most favorable prospects possible. Bowen believes Ellsberg's study is convincing and keeps on research on regarding topic.

Tolerance of ambiguity has also shown to have strong relationship with career choices, career satisfaction together with academic major choices. Budner (1962) found that in their selection of a preferred field of practice, medical students who were tolerant of ambiguity tended to choose relatively unstructured field such as psychiatry, while those intolerant of ambiguity tended to select relatively structured fields such as surgery. According to Malaska (1997), during an investigation of tolerance of ambiguity in adult college students, Tatzal discovered in 1980 that students in the arts scored significantly higher in tolerance for ambiguity than students in business. In addition, creativeness has been found correlated with the ability to withstand the lack of structure, the lack of predictability, the lack of control and tolerance of ambiguity by Irwin in 1996, supporting the hypothesis that students within the arts should score higher for tolerance of ambiguity. Stoycheva (1998) also found that students from art school were more tolerant than those from medical and technical universities. Ehrman (1993) found that thick ego boundary people, who are intolerant of ambiguity, are more likely to take up engineering, certain branches of medicine, law enforcement and business as their professions, whereas people with thin boundary, who are more tolerant of ambiguity, tend to be engaged in arts, social service work, and the teaching of literature. Frone (1990) attempted to integrate several studies on the relationships among tolerance of ambiguity, role stress, and job satisfaction. In his meta-analysis of 13 empirical studies, he found that TOA was a valuable predictor of job satisfaction when there was a role ambiguity. More specifically, those people who were more tolerant of ambiguity showed higher job satisfaction than those who were less tolerant of ambiguity.

What's more, the role of intelligence and creativity as related to tolerance of ambiguity is also taken as a research focus. As Malaska (1997) indicated, administering Budner's measure of intolerance of ambiguity and Karlin's Wonderlic Personnel Test, Raphael, Moss & Cross demonstrated a high relationship of intolerance of ambiguity and measures of intelligence. The authors called for further investigations of indentifying intelligence in the construct of intolerance of ambiguity, especially using Budner's scale. Furthermore, increasing amounts of research have indicated that tolerance of ambiguity is closely related to creativity. Tegano (1990) found a significant and positive relationship between tolerance of ambiguity and creativity. Furnham (1995) noted that open-mindedness, which has been equated with tolerance of ambiguity, may be a predisposition to critical thinking. Stoycheva (2003) argues that tolerance of ambiguity is an important source of creativity. Firstly, creative work puts high demands on one's ability to tolerate ambiguities. In the process of creating something new, individuals need to accept and learn to cope with the concomitant feelings of anxiety and psychological discomfort. Secondly, tolerance of ambiguity integrates the basic qualities of creativity such as risk-taking, non-conformism, openness to experiences and humor so that it keeps a balance between resistance and adaptation that characterize creativity. Thirdly, when faced with ambiguous situations, it is important to control the tendency to jump directly to easy, simple, and unambiguous solutions. "Resistance to premature closure and psychological openness are beneficial to the creative process, allowing time and space for a free and flexible exploration of the incoming information". Finally, ambiguity tolerance is also important in making decisions. Decision-making is required at crucial moments in the process of generating, evaluating, selecting and implementing solutions. Tolerating ambiguity helps remain open to various alternatives and avoid premature closure on a single option. In addition, ambiguity tolerance helps sustain creative motivation. However, Stoycheva points out that tolerance of ambiguity is necessary for creativity but not enough. Intellectual competencies, domain-specific knowledge and skills, creativity-relevant abilities, task commitment, motivation and other personality traits are also important.

Tolerance of ambiguity is also found closely related to need for precision and course structure. A study by Madhubalan Viswanathan (1997) showed that need for precision is negatively related to tolerance for ambiguity. In other words, people with a high need for precision will have a low tolerance for ambiguity, while people with a low need for precision will have a high tolerance of ambiguity. DeRoma, Martin & Kessler (2003) investigated the relationship between ambiguity tolerance and need for course structure, with 101 students including 52 undergraduates and 49 graduates participating in their study. Results show that for the undergraduates, significant correlation was noted between tolerance of ambiguity scores and importance ratings for having a clear schedule of assigned readings and anxiety related to either having no test dates or test dates provided rescheduled; for the graduates, a significant correlation was found for the tolerance of ambiguity score and importance ratings for exams having a single, correct answer. Significant correlations were also found between the score for tolerance of ambiguity and several anxiety scores, including not having a test date initially given or a test date being rescheduled, grading criteria not specifically outlined, exams that required applied knowledge, and testing situations in which there was no single, correct answer.

IV. RELATED RESEARCHES TOWARDS TOLERANCE OF AMBIGUITY IN THE FRAMEWORK OF SECOND/FOREIGN LANGUAGE LEARNING

A. *Researches Oversea*

In terms of significant researches about tolerance of ambiguity as related to second or foreign language learning, Naiman's research comes to be one of great importance at the early stage. Using Budner's (1962) scale of tolerance of ambiguity, Naiman et al. (1978) conducted a study among 72 English-speaking students who studied French in Toronto, Canada. The results showed that tolerance of ambiguity scores were positively correlated with their performance of French listening comprehension task, but no significant correlation was found with their oral French imitation task. Thus, Naiman found that tolerance of ambiguity, though a concept in psychological field, can work as a significant element predicting the success of foreign language learning under the condition that the measurement is reliable and valid.

Chapelle (1983) later investigated the relationship between ambiguity tolerance and success in acquiring English as a second language in adult learners. Combining Budner and Norton's definition of ITOA, she analyzed the various ambiguous situations existing in second language learning and acquisition and found that ambiguity could have impacts on learning context, good learner characteristics and learning strategies. She also pointed out that the relationship between TOA, good language learners and learning strategies deserved our attention.

Another important related study is the one made by Chapelle & Roberts (1986). Employing Norton's MAT-50 (1975), a 61-item Likert type scale, as the measurement of tolerance of ambiguity, they put this scale into practical research for the first time. In this research, the MAT-50 scale was distributed to the subjects --- 61 adult speakers of Arabic, Japanese or Spanish students who were learning English as a second language at the University of Illinois during the course of a fall semester under the researchers' administration. Students were also arranged to take several English proficiency tests at the beginning of the semester as well as the end of the semester. No significant correlations between tolerance of ambiguity and language proficiency scores were found at the beginning of the semester, however, significantly positive correlations were found between scores on the MAT-50 and proficiency scores at the end of the semester. Chapelle & Roberts's study not only proved the high reliability and validity of Norton's MAT-50 scale, but also indicated that tolerance of ambiguity is a very important factor related with learners' performance of language learning, and learners with higher tolerance of ambiguity tend to be more proficient in language learning, especially for the study of grammar, structure and listening comprehension. Reiss (1985) also found a positive relationship between tolerance of ambiguity and university students' ratings of themselves as foreign language learners. Ely (1989; 1995) also conducted a study on the tolerance of ambiguity of South Korean students in the process of English learning, and indicated that it is crucial for the students to understand the uncertainty of the language phenomenon. Later, in testing the level of ambiguity tolerance of Greek civil servants when learning English as a foreign language, Kazamia (1999) found that tolerance of ambiguity varies, depending on skills and language learning situations, and learners cannot tolerate the ambiguities produced by their failure to express adequately their ideas in writing and speaking. This situation triggers a considerable amount of intolerance that might impede their progress in these skills.

Some attention is also attached to the link between tolerance of ambiguity and risk-taking. According to Rubin (1975), good language learners are characterized by a willingness to guess; to appear foolish in order to communicate and to use whatever knowledge they have of the target language in order to create novel utterances. All these could be regarded as risk-taking behaviors (Beebe, 1983). Ely (1989) further studied the risk-taking behavior of university students enrolled in Spanish courses during the first two quarters of the academic year. Ely described risk-takers as characterized by "a lack of hesitancy about using a newly encountered linguistic element; a willingness to use linguistic elements perceived to be complex or difficult; a tolerance of possible incorrectness or inexactitude in using the language; and an inclination to rehearse a new element silently before attempting to use it aloud" (Ely, 1989, p. 438). He added that decreases in risk-taking frequently occur when students feel extreme discomfort in the language classrooms and students' intolerance of ambiguity may "inhibit students' risk taking and interfere with their acquisition of new learning strategies" (Ely, 1995. p. 87). Oxford (1999) later proved students who have low TOA often avoid taking risks and their language practice becomes restricted.

Other researches have also been done towards tolerance of ambiguity and second language learning strategy use ever since Ely (1989) found tolerance of ambiguity was one of the factors that influenced L2 learners' use of various second language learning strategies. According to Ely (1989), tolerance of ambiguity was found to be a significant negative predictor of various strategies which involve focusing on individual language elements such as planning out what to say ahead of time, thinking carefully about grammar when writing, looking up words in English right away when reading; and not a predictor of strategies as focusing on grammar or vocabulary when reading, or trying to understand every word when listening. Meanwhile, tolerance of ambiguity was found to positively predict proofreading one's written work for spelling and accent marks, and not significantly positively predict strategies as looking for overall meaning in reading, listening and guessing meaning from context. He also found that students with high tolerance of ambiguity favored those more creative techniques of constructing mental images to help them memorize new words. Through this study, Ely not only developed a situation-specific scale for measuring the tolerance of ambiguity level of second language learners, which consists of 12 items, representing various aspects of language learning and use, but also laid a solid foundation for his later study, in which Ely (1995) further complemented that tolerance of ambiguity may

influence at least three areas of language learning: 1) learning individual linguistic elements (phonological, morphological, syntactic, semantic, etc.) 2) practicing language learning skills; and 3) adopting those skills as permanent strategies. Oxford (1990), Rubin & Thompson (1994) also found that students who were more tolerant of ambiguity—able to reconcile and accommodate ideas or information that may be contradictory or inconsistent—used significantly different strategies in some instances than students who were less tolerant even though they failed to find out what strategies tolerant or intolerant learners would prefer. Lee (1998) finds that there are no significant differences between science students and arts students in the use of language learning strategies and tolerance of ambiguity. Griffiths (2004) found that higher level students reported highly frequent use of learning strategies relating to the tolerance of ambiguity in a study involving 348 students in a private language school in New Zealand.

Great amount of research work has also been done to connect tolerance of ambiguity to ego boundary in second language learning domain. Ego boundary is first defined by Hartman (1991) as the "system of mental operations, cognitive and affective, that constitute an individual's sense of self". After giving another try to define it operationally as the "degree to which individuals tend to compartmentalize their experience" (Ehrman, 1999. p. 68), Ehrman related ego boundary with tolerance of ambiguity in the situation of second language learning. According to Ehrman (1993), people with thick ego boundaries tend to distinguish their experiences and to separate themselves from the outside world. They are unreceptive to outside influences such as new languages and cultures. They have little flexibility and adaptability. They dislike open-ended activities and have a strong preference for clear categories. They are characterized by "an inability to learn by osmosis, to make use of teachers and other native speakers as models with which to identify, to permit development of a target language persona, and above all to tolerate ambiguity" (Ehrman, 1999, p. 68). Thick boundary students are likely to be motivated by task accomplishment and achievement of control, whether of their time use or of learned material. They usually seek a sense of order and can find too much open-endedness disruptive to their sense of security. In contrast, people with thin ego boundaries are inclined to rely on strategies of receptivity to outside influences. They are more open and flexible to new information and are more likely to be creative. They are free to entertain a number of innovative and creative possibilities and not be cognitively or affectively disturbed by ambiguity and uncertainty. They can not only tolerate but also embrace ambiguity. They tend to perform better in oral production, interactive comprehension and reading ability. Thin boundary students tend to be motivated by establishing relationships --- with people, with a new culture or among concepts. They like the freedom to make a wide range of associations between concepts and experiences, even if some of the associations may seem strange to their thicker boundary classmates. However, just as thick boundaries alone are not predictive of learning difficulties; thin ego boundaries alone can not guarantee the success of language learning. It is people with flexible ego boundaries and with a certain degree of ambiguity tolerance that are more likely to succeed in second language learning. Ehrman (1993) further reinforced the theoretical framework of tolerance of ambiguity in linguistic domain by developing three levels of tolerance of ambiguity, which are "intake": letting information enter one's conceptual schema, "tolerance of ambiguity proper": accepting contradictory and incomplete information, and "accommodation": making distinctions, setting priorities and restructuring cognitive schemata.

Some researchers also related tolerance of ambiguity with the acquisition of specific aspects of second/foreign language learning, such as vocabulary retention and reading comprehension. Grace (1998) studied the effects of lexical ambiguity in computer-assisted language learning (CALL) on beginning second language learners, attempting to determine whether learners' personality types had any effect on the retention of second language vocabulary independently of the translation issue and in an ambiguous CALL context. Analyses of vocabulary retention tests showed that students of all personality types learned and retained a significant amount of vocabulary regardless of their level of tolerance of ambiguity. Although no effect of tolerance of ambiguity seemed to be found on vocabulary retention, yet the need for beginning vocabulary learning software which rendered meaning clearly while promoting deep processing is greatly supported. Using the MAT-50 (Norton, 1975) and a reading comprehension subtest, El-Koumy (2000), examined the differences in foreign language reading comprehension among high, middle, and low ambiguity tolerance students. 150 English-as-a-foreign-language (EFL) university students randomly drawn from Egypt participated in the study. Results showed a significant variance in the mean scores among the high, middle, and low ambiguity tolerance groups. The t-test showed that the moderate ambiguity tolerance group scored significantly higher than the low and high groups, and the low and the high groups were not found to be significantly different. This finding somehow suggests that moderate level of tolerance of ambiguity facilitates foreign language learning.

Studies are also being conducted to explore the relationship between tolerance of ambiguity and gender. Although Senfeld (1996) states that the gender shows no difference in tolerance of ambiguity, most studies in this area seem to have reported a greater tolerance of ambiguity in women. For example, Brougher (1984) reveals that females are more tolerant than males. Reporting on a study at the University of Alabama, Saleh (1998) concludes that there are significant gender differences in the level of tolerance of ambiguity. Clack (1999) discovers that the men feel better equipped with "tolerance of ambiguity and uncertainty" compared to the women who feel more confident in their "open-mindedness". It seems that both of the male and female subjects claim themselves with a high level of tolerance of ambiguity.

*B.  Researches in China*

Great attention has been drawn on tolerance of ambiguity as a variable in language learning domain in recent few years in China ever since Wen & Wang (1996), in their study to find a relationship of learner variables to CET-4 scores,

first identified tolerance of ambiguity as one of the six variables that had direct effects on EFL achievement, which has directly brought about lots of researches concerning various aspects about tolerance of ambiguity of Chinese learners who are learning English as a foreign language.

The first category of these researches is about the theoretical review of the concept of tolerance of ambiguity into English language learning field, focusing on introducing tolerance of ambiguity as an important learners' variable in English language teaching environment. Researches of Wang (2004), Yin (2005), Zeng & Ye (2005), Shu (2005), Jin (2006), Zhao & Yang (2007), Lai (2009) fall into this category.

Researches are also being done towards the correlation between tolerance of ambiguity and English language proficiency. In these researches, attention is put not only to detect the global level of English language learners' tolerance of ambiguity in China, but also on the relationship between this level and students' English learning performances, as indicated in the researches of Chen (2004), Xu (2005), Shao (2005), Liu (2006) and Bu (2007). Through all these empirical studies, students' tolerance of ambiguity has been found to be a significant predictor of their English learning performances, and a positive correlation has been found between students' TOA and their English proficiency.

The relationship between tolerance of ambiguity and students' learning anxiety has at the same time aroused much attention. According to the researches of Zhang & Wang (2006), Zhang (2007) and Yang & Wang (2009), students' tolerance of ambiguity is closely related to their learning anxieties. Yet, students with different level of tolerance of ambiguity varied in their degree of language learning anxiety, and students with higher level of tolerance of ambiguity and lower level of anxiety tended to perform better in English language learning, compared with those with lower level of tolerance of ambiguity and higher level of anxiety.

As for the influence of tolerance of ambiguity on foreign language learning strategy choice, one research made by Zhang Qingzong is of influential importance. Using Ely's (1995) SLTAS and Oxford's (1990) Strategy Inventory for Language Learning (SILL), Zhang (2004) studied the effects of tolerance of ambiguity of English majors on their strategy use. Results showed that tolerance of ambiguity correlated positively with learners' strategy use and that the degree of tolerance of ambiguity determined how learners selected and used learning strategies. Learners with high level of tolerance of ambiguity could selectively and flexibly use their strategies whereas learners with low level of tolerance of ambiguity used their learning strategies blindly and inflexibly.

More researches come about the tolerance of ambiguity with specific aspects of English learning. Zhou (2000), Du Z. M. (2006), Yu (2007), Tang (2009), Ba (2012) and Wang (2013) conducted studies towards tolerance of ambiguity in relation with English listening comprehension, investigating how tolerance of ambiguity affected Chinese learners' listening comprehension of English. It was found that students with high tolerance of ambiguity tended to perform significantly better in the overall listening skill and the sub-skills of listening for retrospective tasks, inference and main ideas than students with low tolerance of ambiguity. Yu (2007) also found students' tolerance of ambiguity has a significantly positive correlation with their use of listening comprehension strategies, especially with their use of cognitive strategies and metacognitive strategies. There is a positive correlation between metacognitive strategies and social/affective strategies of students with high tolerance of ambiguity, and significantly positive correlation between cognitive strategies and social/affective strategies, and metacognitive strategies and cognitive strategies, which indicates that students with high tolerance of ambiguity tend to choose learning strategies of listening comprehension selectively when facing with different learning materials and tasks. At the same time, there exists a significantly positive correlation among strategies when students with low tolerance of ambiguity use learning strategies, which indicates that these students choose strategies blindly and optionally. Ba (2012) found that students with high tolerance of ambiguity are more likely to choose and take advantage of different skills to complete relevant tasks in listening comprehension. Wang (2013) indicated that students with high tolerance of ambiguity tend to use compensation strategies, metacognitive strategies and affective strategies in listening process. Du & Yang (2006) correlated tolerance of ambiguity with English speaking teaching, suggesting including the consideration of students' tolerance of ambiguity while teachers were designing and organizing in-class English speaking activities. Useful and practical suggestions about classroom activities for teaching speaking English were provided in their study as well. Great concern has also been shown regarding tolerance of ambiguity and reading comprehension. Li (2004), Liu & Sun (2005), Li (2010) and Liu (2011) found a positive correlation between tolerance of ambiguity and students' overall reading comprehension proficiency, besides, students with higher level of reading proficiency and those with lower level of reading proficiency varied significantly in their tolerance of ambiguity. After conducting a research on students' tolerance of ambiguity and reading anxiety, Huang (2006) and Wu (2009) came to the conclusion that both tolerance of ambiguity and learning anxiety have great impact on students' English reading comprehension ability and students' tolerance of ambiguity negatively correlate with anxiety in reading. Thus, Shi (2007) suggested improving students' ability to tolerate ambiguity while cultivating students' reading ability.

Some research interest in this field also exists in detecting gender differences towards Chinese students' tolerance of ambiguity in English learning. With the major concern of gender differences as the study focus, Li Erlong (2006; 2007) found that there are statistically significant differences by gender in tolerance of ambiguity. Females are significantly more tolerant of ambiguity than males on the whole. Females are much more tolerant of ambiguity than males in reading, writing, pronunciation and speaking. However, in terms of listening, grammar, vocabulary learning, translation

and guessing of lexical meaning, there are no significant differences between the two genders. Both females and males have intermediate tolerance of ambiguity. The main gender differences towards students' tolerance of ambiguity found here was thought by the author to come from the gender differences in learning style and personality traits. However, Li (2004), Bu (2007), Liu (2006), Yu (2007) and Zhang (2007) failed to find any statistically significant differences between tolerance of ambiguity and gender. Yet, Zhang (2007) found district-related differences of tolerance of ambiguity, i.e. students from cities have shown lower level of tolerance of ambiguity compared with those from countryside.

## V. CONCLUSION

Tolerance of ambiguity has become a research topic which more and more researchers take interest in. Compared with other variables, such as anxiety, empathy, self-esteem, motivation which have been well discussed and investigated by researchers and theorists, the study of tolerance of ambiguity is a relatively under-cultivated area, although it seems to bear no less importance. On the basis of all the above review of relative literature, researches about tolerance of ambiguity up till now mainly concentrate on detecting the correlation on learners' overall language learning performance and their TOA, the differences of learners' level of TOA by gender and the relationship between TOA and learners' second language learning strategies, discussing the great influence that tolerance of ambiguity has made on the second language learning process. Yet, further studies in related field are still desirable, such as the relationship between tolerance of ambiguity and the specific language skills, especially the productive ones as speaking and writing, tolerance of ambiguity and the use of various strategies relating with specific skills in language learning, as well as the training of learners' tolerance of ambiguity so as to help facilitate in-class language learning efficiency as well as that of after-class self-directed language learning.

## REFERENCES

[1] Ba, H. B. (2012). A study of the correlation between processing strategies and tolerance of ambiguity in listening comprehension of college English. *Journal of Yangtze Normal University*, *28*(4), 104-109.

[2] Beebe, L. M. (1983). Risk-taking and the language learner. In H. W. Seliger, & M. H. Long (Eds.), *Classroom oriented research in second language acquisition* (pp. 39-65). Rowley, MA: Newbury House.

[3] Brougher, J. Z. (1984). Elementary teacher perceptions of and responses to ambiguity (tolerance). *Dissertation Abstracts International, Section A: The Humanities and Social Science (DAI-A), 45*(04), 1071.

[4] Brown, H. D. (1991). Breaking the language barriers: Creating your own pathway to success. Yarmouth, ME: Intercultural Press Inc.

[5] Budner, S. (1962). Intolerance of ambiguity as a personality variable. *Journal of Personality*, *30*, 29-50.

[6] Bu, L. N. (2007). The influence of ambiguity tolerance on Chinese college students during their English learning. (Unpublished MA dissertation). Xi'an Electronics and Technology University, China.

[7] Chapelle, C. A. (1983). The relationship between ambiguity tolerance and success in acquiring English as a second language in adult learners. (Unpublished doctoral dissertation). University of Illinois, Urbana-Champaign, USA.

[8] Chapelle, C., & Roberts, C. (1986). Ambiguity tolerance and field independence as predictors of proficiency in English as a second language. *Language Learning*, *36*, 17-45.

[9] Chen. W. C. (2004). A Study of the correlation between English majors' scores of TEM4 and tolerance of ambiguity. *CELEA Journal*, *27*(1), 3-6.

[10] Child, I. L. (1965). Personality correlates of esthetic judgment in college students. *Journal of Personality*, *33*, 476-511.

[11] Clack, G. B., & John, O. H. (1999). Gender differences in medical graduates' assessment of their personal attributes. *Medical Education*, *33*(2), 101-106.

[12] DeRoma, V. M., Martin, K. M., & Kessler, M. L. (2003). The Relationship between tolerance for ambiguity and need for course structure. *Journal of Instructional Psychology*, *30*(2), 104-109.

[13] Du, Y., & Yang, Q. (2006). Tolerance of ambiguity and teaching design of oral English class. *Journal of Wuxi Education College*, *26*(3), 71-73.

[14] Du, Z. M. (2006). Enlightenment of ambiguity tolerance and schema theory on college English listening teaching. *Journal of the Chinese People's Armed Police Force Academy*, *22*(3), 43-45.

[15] Ehrlich, D. (1965). "Intolerance of ambiguity", Walk's A Scale: Historical comment. *Psychological Reports*, *17*, 591-594.

[16] Ehrman, M. E. (1993). Ego boundaries revisited: Toward a model of personality and learning. In J. E. Alatis (Ed.), *Strategic interaction and language acquisition: Theory, practice, and research* (pp. 330-362). Washington, DC: Georgetown University.

[17] Ehrman, M. E. (1999). Ego boundaries and tolerance of ambiguity in second language learning. In J. Arnold (Ed.), *Affect in language learning* (pp. 68-86). Cambridge: Cambridge University Press.

[18] El-Koumy, A. S. A. (2000). Differences in FL reading comprehension among high-, middle-, and low-ambiguity tolerance students. Paper presented at the National Symposium on English Language Teaching in Egypt, March 21-23.

[19] Ely, C. M. (1989). Tolerance of ambiguity and use of second language strategies. *Foreign Language Annals*, *22*, 437-445.

[20] Ely, C. M. (1995). Tolerance of ambiguity and the teaching of ESL. In J. M. Reid (Ed.), *Learning styles in the ESL/EFL classroom* (pp. 87-96). Beijing: Foreign Language Teaching and Research Press.

[21] Frenkel-Brunswik, E. (1949). Intolerance of ambiguity as an emotional and perceptual personality variable. *Journal of Personality*, *18*, 108-143.

[22] Frone, M. R. (1990). Intolerance of ambiguity as a moderator of the occupational role stress-strain relationship: A meta-analysis. *Journal of Organizational Behavior*, *11*, 309-320.

[23] Furnham, A. (1995). The relationship of personality and intelligence to cognitive learning style and achievement. In D. H. Saklofske, & M. Zeidner (Eds.), *International handbook of personality, and intelligence* (pp. 397–413). New York: Plenum Press.

[24] Grace, C. (1998). Personality type, tolerance of ambiguity, and vocabulary retention in CALL. *CALICO Journal*, *15*(1–3), 19-45.

[25] Griffiths, C. (2004). Language learning strategies: Theory and research. *Occasional Paper*, *No.1*, February. Auckland, New Zealand: School of Foundation Studies AIS St. Helens.

[26] Hartmann, E. (1991). Boundaries in the mind: A new psychology of personality. New York: Basic Books.

[27] Huang, D. M. (2006). Correlation study on reading anxiety and tolerance of ambiguity. *Journal of Hubei Institute of Education*, *23*(11), 126-128.

[28] Jin, Y. H. (2006). The influence of tolerance of ambiguity on English learning. *Journal of Qiqihar Medical College*, *27*(7), 860-861.

[29] Kazamia, V. (1999). How tolerant are Greek EFL learners of foreign language ambiguities? *Leeds Working Papers in Linguistics*, *No.7*, 69-78. University of Leeds, UK. Retrieved Nov. 27, 2014 from http://www.leeds.ac.uk/arts/download/1320/kazamia1999.

[30] Kirton, M. J. (1981). A reanalysis of two scales of tolerance of ambiguity. *Journal of Personality Assessment*, *45*(4), 407-414.

[31] Lai, P. (2009). The necessity of studying learners' tolerance of ambiguity in foreign language education. *Forum on Chinese Culture*, *7*, 287-289.

[32] Lee, J. Y. (1998). Language learning strategies and tolerance of ambiguity of Korean midshipmen learning English as a foreign language. *Dissertation Abstracts International, Section A: The Humanities and Social Science (DAI-A), 59* (03), 760.

[33] Li, E. L. (2006). Gender differences on tolerance of ambiguity. *Journal of Sanmenxia Polytechnic (Comprehensive Edition)*, *5*(3), 65-67.

[34] Li, E. L. (2007). A study of non-English majors' differences in tolerance of ambiguity by gender and proficiency. (Unpublished MA dissertation). Jiangxi Normal University, China.

[35] Li, L. (2004). A study of the correlation between reading comprehension and tolerance of ambiguity in English learning. (Unpublished MA dissertation). Shandong University, China.

[36] Li, M. Y. (2010). The impact of ambiguity tolerance on reading comprehension of English majors. *Journal of Hubei University of Economics (Humanities and Social Sciences)*, *7*(4), 198-199.

[37] Liu, F. Q., & Sun, J. K. (2005). A Study on the influence of ambiguity tolerance on foreign language reading comprehension. *Journal of Shandong University of Technology (Social Sciences)*, *21*(6), 100-103.

[38] Liu, M. (2011). A survey on the relationship between tolerance of ambiguity and English reading comprehension performance of three-year English majors in college. *Foreign Language Teaching and Research*, *12*, 116-117.

[39] Liu, Y. (2006). An analysis of tolerance of ambiguity in second language acquisition. (Unpublished MA dissertation). Harbin Institute of Technology, China.

[40] MacDonald, A. P. Jr. (1970). Revised scale for ambiguity tolerance: Reliability and validity. *Psychological Reports*, *26*, 791-798.

[41] Malaska, A. K. (1997). Ambiguity tolerance differences among college students. (Unpublished MA dissertation). Truman State University, Missouri, USA.

[42] Martin, J. G., & Westie, F. R. (1959). The tolerant personality. *American Sociological Review*, *24*, 521-528.

[43] McDougall, W. (1926). Outline of abnormal psychology. New York: Charles Scribner's Sons.

[44] McLain, D. L. (1993). The MSTAT-Ⅰ: A new measure of an individual's tolerance for ambiguity. *Educational and Psychological Measurement*, *53*(1), 183-189.

[45] Naiman, N., Frohlich, M., Stern, H., & Todesco, A. (1978). The good language learner. (Research in Education Series No.7). Toronto: Ontario Institute for Studies in Education.

[46] Norton, R. W. (1975). Measurement of ambiguity tolerance. *Journal of Personality Assessment*, *39*, 607-619.

[47] Nutt, P. C. (1988). The tolerance for ambiguity and decision making. The Ohio State University College of Business Working Paper Series, WP88-291, March. Columbus, Ohio: The Ohio State University College of Business.

[48] Oxford, R. L. (1990). Language learning strategies: What every teacher should know. New York: Harper Collins.

[49] Oxford, R. L. (1999). Anxiety and the language learner: New insights. In J. Arnold (Ed.), *Affect in language learning* (pp. 58–67). Cambridge: Cambridge University Press.

[50] Reiss, M. A. (1985). The good language learner: Another look. *Canadian Modern Language Review*, *41*(3), 511-523.

[51] Rubin, J. (1975). What "the good language learner" can teach ss. *TESOL Quarterly*, *9*(1), 41-51.

[52] Rubin, J., & Thompson, I. (1994). How to be a more successful language learner (2nd ed.). Boston, MA: Heinle & Heinle Publishers Inc.

[53] Rydell, S. T., & Rosen, E. (1966). Measurement and some correlations of need cognition. *Psychological Reports, 19*,139-165.

[54] Saleh, A. I. (1998). The nexus of brain hemisphericity, personality types, temperaments, learning styles, learning strategies, gender, majors, and cultures. *Dissertation Abstracts International, Section A: The Humanities and Social Science (DAI-A), 58*(08), 2598.

[55] Senfeld, L. (1996). Math anxiety and its relationship to selected student attitudes and beliefs. *Dissertation Abstracts International, Section A: The Humanities and Social Science (DAI-A), 56*(07), 2598.

[56] Shao, L. (2005). Analysis on the correlation between tolerance of ambiguity and foreign language proficiency. *Modern Primary and Secondary Education*, *2*, 47-48.

[57] Shi, J. Q. (2007). Improving tolerance of ambiguity in reading proficiency cultivation. *Occupational Circle*, *21*, 89-90.

[58] Shu, J. (2005). The influence of tolerance of ambiguity on foreign language learning. *Journal of Southwest University for Nationalities (Humanities and Social Science)*, *26*(6), 347-349.

[59] Stoycheva, K. (1998). Ambiguity tolerance: Adolescents' responses to uncertainty in life. Research Report (ERIC Document Reproduction Service No. ED 422547). Sofia, Belgaria.

[60] Stoycheva, K. (2003). Talent, science, and education: How do we cope with uncertainty and ambiguities? In P. Csermely, & L. Lederman (Eds.), *Science education: Talent recruitment and public understanding* (pp. 31-43). *NATO Science Series* Vol. V/38. Amsterdam: IOS Press.

[61] Tang, W. S. (2009). The influence of ambiguity tolerance on graded teaching of college English visual-audio-oral class. *Science & Technology Information*, *19*, 548 turned to 552.

[62] Tegano, D. W. (1990). Relationship of tolerance of ambiguity and playfulness to creativity. *Psychological Reports*, *66*, 1047-1056.

[63] Viswanathan, Madhubalan. (1997). Individual differences in need for precision. *Personality and Social Psychology Bulletin*, *23*(7), 717-735.

[64] Wang, D. Q. (2004). An analysis of tolerance of ambiguity in second language learning. *Journal of Northeastern University (Social Science)*, *6*(4), 303-305.

[65] Wang, L. Y. (2013). On hearing strategy based on the impact of fuzzy tolerance. *Journal of Henan University of Technology (Social Science)*, *9*(2), 139-141.

[66] Wen, Q. F. (2003). The way to success for English study. Shanghai: Shanghai Foreign Language Education Press.

[67] Wen, Q. F., & Wang H. X. (1996). The relationship of learner variables to scores on CET Band–4. *Foreign Language Teaching and Research*, *28*(4), 33-39.

[68] Wu, W. (2009). A study on ambiguity tolerance and reading anxiety of non-English majors university students. *Foreign Language Teaching and Research*, *29*, 98-99.

[69] Xu, Y. (2005). Chinese learners' tolerance of ambiguity in learning English as a foreign language. *Journal of Zhejiang Education Institute*, *1*, 24-28.

[70] Yang, X. J., & Wang, H. (2009). Correlation study on reading anxiety, tolerance of ambiguity and foreign language learning of non-English-major university students. *Journal of Nanjing Xiaozhuang University*, *2*, 77-80.

[71] Yin, Y. (2005). The influence of tolerance of ambiguity on English learning and its enlightenment on English teaching. *Foreign Language World*, *2*, 58-61.

[72] Yu, Y. (2007). The influence of tolerance of ambiguity on learning strategies of listening comprehension. (Unpublished MA dissertation). Jilin University, China.

[73] Zeng, Y. W., & Ye, Z. C. (2005). The Need for Tolerance of Ambiguity in Successful Authentic Language Learning Context of Internet. *CAFLE*, *102*, 11-14.

[74] Zhang, Q. Z. (2004). Effects of tolerance of ambiguity on the selection of language learning strategies. *Foreign Language Teaching and Research*, *36*(6), 457-461.

[75] Zhang, S. M. (2007). Urban-rural and gender differences in foreign language tolerance of ambiguity and anxiety. *Journal of Hubei Institute of Education*, *24*(7), 68-69.

[76] Zhang, S. M. (2007). On tolerance of ambiguity and anxiety in English language learners. *Journal of Hebei University of Economics and Trade (Comprehensive Edition)*, *7*(2), 95-98.

[77] Zhang, S. M., & Wang, G. P. (2006). Mediating role of language learning anxiety in the relationship between tolerance of ambiguity and English language learning. *Psychological Development and Education*, *4*, 64-67.

[78] Zhao, Q., & Yang, M. (2007). Ambiguity tolerance and its enlightenment to second language acquisition. *Journal of Panzhihua University*, *24*(4), 76-79.

[79] Zhou, Y. (2000). The influence of ambiguity tolerance on listening comprehension. *Journal of PLA University of Foreign Languages*, *23*(4), 75-78.

**Chen Liu** was born in Qingdao, China in 1979. She received her M.A. degree in linguistics from Shandong University, in Jinan, China in 2008 and is studying for her PH. D. in Shandong Normal University.

She is currently a teacher in the School of Foreign Languages, Shandong Normal University, Jinan, China. Her research interests include applied linguistics and American culture.

Ms. Liu is the Team Leader of Shandong province for Young Learners' English of Cambridge Assessment and Operations Group.